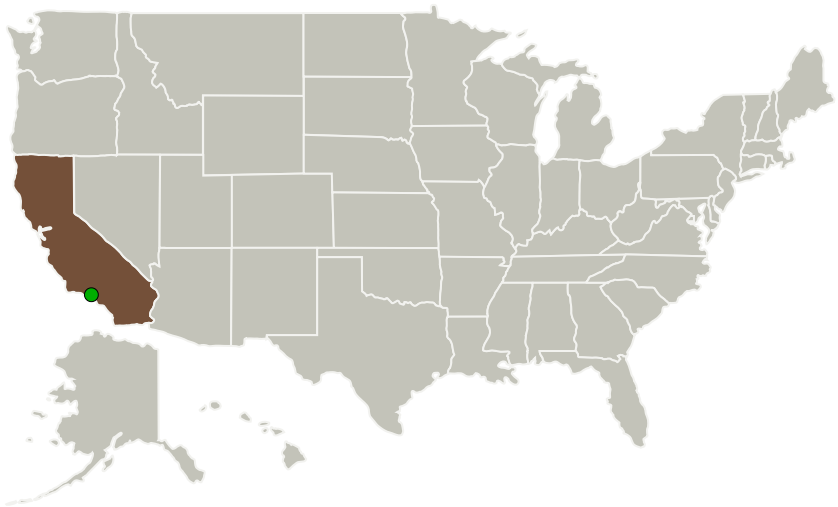
An Implant-Passivated Blocked Impurity Band Germanium Detector for the Far Infrared, Phase II

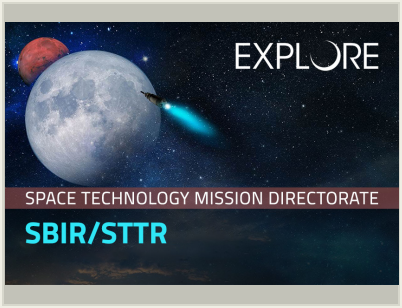
Completed Technology Project (2011 - 2013)

Project Introduction

We propose to fabricate a germanium blocked-impurity-band (BIB) detector using a novel process which will enable us to: 1- fabricate a suitably-doped active layer using the well-established bulk crystal-growth process, which guarantees excellent dopant control and extremely low compensating impurities, and 2- grow the blocking layer using an implant-passivation technique which will produce the required high purity and a very sharp transition from the active to blocking layer. These features are key in design and optimization of the multi-layered structure of BIBs, and their implementation and quality are crucial in optimum operation of these detectors. The proposed process is a drastic departure from conventional epitaxial methods, such as chemical vapor deposition and liquid phase epitaxy, which have yet to produce far IR BIBs suitable for astronomical instruments. Germanium BIBs will offer extended wavelength response up to at least 200µm, high quantum efficiency, high immunity to ionizing radiation, and elimination of long-term transient and memory effects. Coupled with their compatibility with Si cryo-CMOS readout multiplexers and the planar, bump-bond hybridization process, these detectors will make possible the construction of large format, high sensitivity FPAs for far IR astronomy and will replace the current unstressed and stressed germanium detectors.

Primary U.S. Work Locations and Key Partners





An Implant-Passivated Blocked Impurity Band Germanium Detector for the Far Infrared, Phase II

Table of Contents

An Implant-Passivated Blocked Impurity Band Germanium Detector for the Far Infrared, Phase II

Completed Technology Project (2011 - 2013)

Organizations Performing Work	Role	Type	Location
TechnoScience Corporation	Lead Organization	Industry	Palo Alto, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

June 2011: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138700)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TechnoScience Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

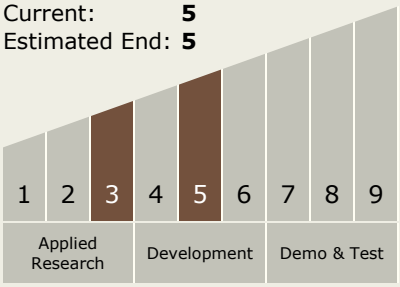
Carlos Torrez

Principal Investigator:

Jam Farhoomand

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



An Implant-Passivated Blocked Impurity Band Germanium Detector for the Far Infrared, Phase II

Completed Technology Project (2011 - 2013)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System